



Univerza v Mariboru

Fakulteta za elektrotehniko,
računalništvo in informatiko



Umetna inteligenca in humanistika v digitalni dobi

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- **Raziskovalna področja:**

- Aplikacije umetne inteligence
- Priporočilni sistemi in iskalniki
- Obdelava naravnega jezika
- Detekcija podobnih vsebin
- Visokozmogljivo računalništvo (HPC)



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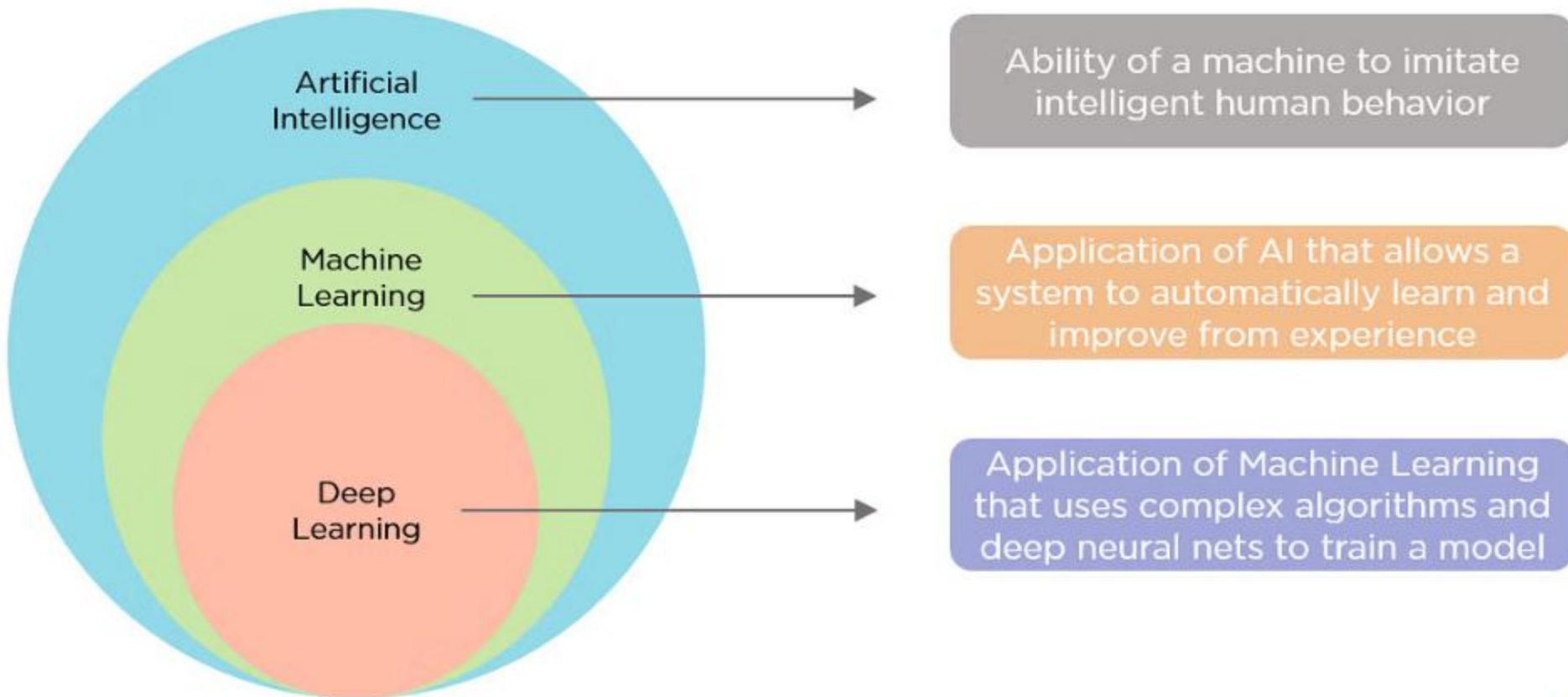
Inštitut za računalništvo

Laboratorij za heterogene računalniške sisteme

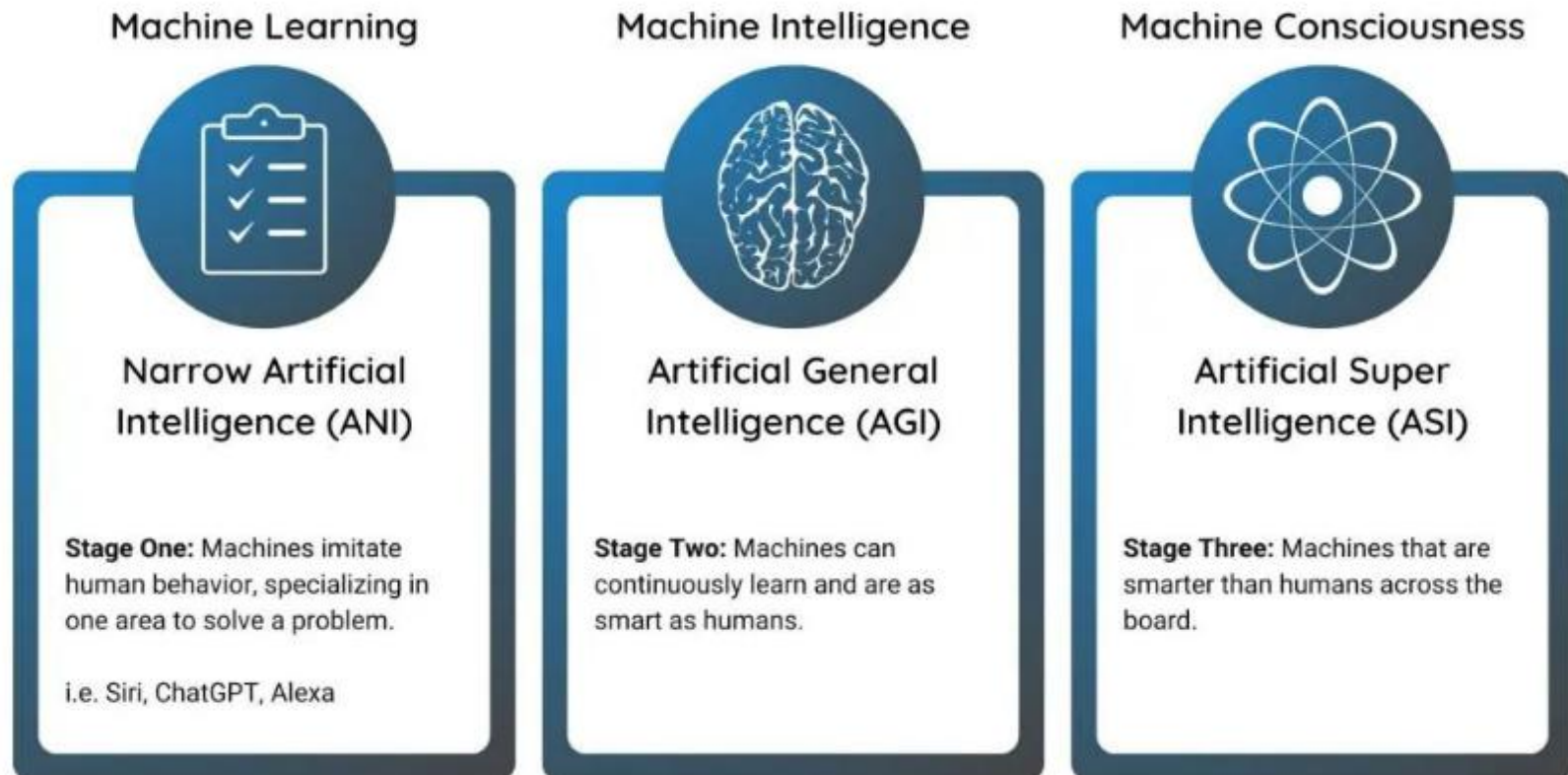
Vsebina

- Umetna inteligenca
 - Kaj je umetna inteligenca in vrste umetne inteligence, uporaba v humanistiki
- Veliki jezikovni modeli
 - Učenje, zmožnosti in aplikacije, omejitve in tveganja
- Umetna inteligenca in digitalni arhivi
 - Avtomatska klasifikacija, povzemanje, semantično iskanje in optično razpoznavanje
- Izbrane aplikacije umetne inteligence v raziskavah
 - Zvitki z območja Herkulaneja, pisava Rongorongo, Yale Digital Collections AI
- Regulacija umetne inteligence
 - EU AI Act, vplivi umetne inteligence
- Umetna inteligenca kot orodje ali orožje?

Umetna inteligencija



Umetna inteligenca



Trenutno smo tukaj

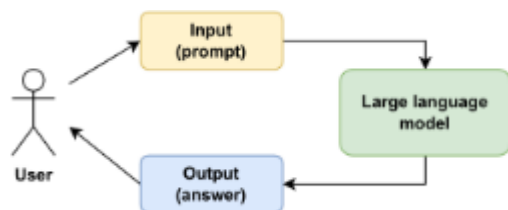
Umetna inteligenca in humanistika

- Umetna inteligenca kot **orodje** disciplin humanistike
 - Literatura (obdelava naravnega jezika, interpretacija del)
 - Zgodovina (analiza zgodovinskih virov, računalniški vid)
 - Umetnostna zgodovina (računalniški vid, klasifikacija slik)
 - Jezikoslovje (jezikovne analize, strojno prevajanje, povzemanje)
 - Arheologija (detekcija najdišč, generativna 3D rekonstrukcija ruševin)
 - Sociologija (analiza grafov, analiza omrežij)
- Analiza besedil
- Ohranjanje, restavriranje in digitalno shranjevanje
- Izobraževanje in učenje
- Knjižničarstvo in arhiviranje
- Etična uporaba umetne inteligence

Veliki jezikovni modeli

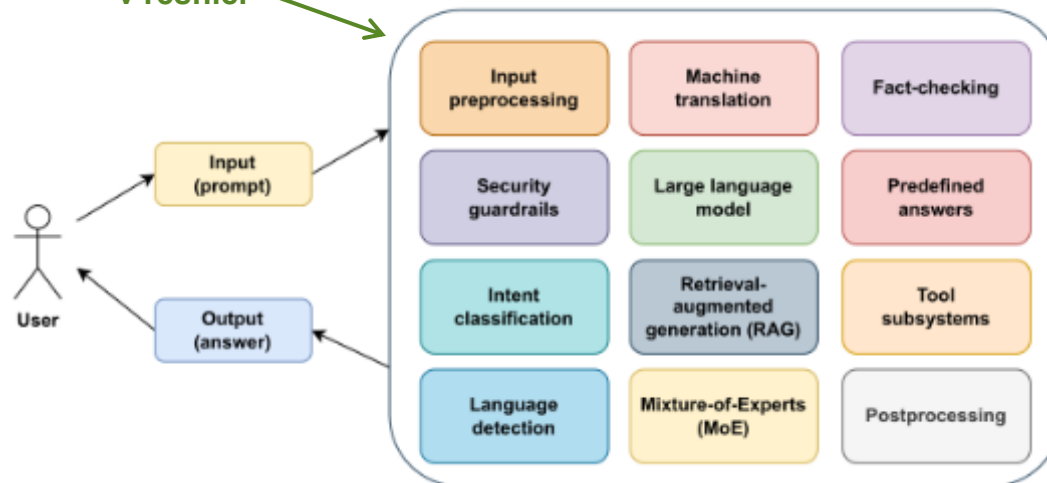
- Naučene globoke nevronske mreže, ki so sposobne izvajati naloge povezane z naravnim jezikom (ang. large language models – LLM)
- Pogovorni sistemi (ang. chatbots)
 - Veliki jezikovni modeli niso pogovorni sistemi!
 - Pogovorni sistemi so aplikacije (ChatGPT, Gemini, Claude, DeepSeek, ...)
 - Veliki jezikovni modeli so generativne komponente teh aplikacij

Kaj ljudje mislijo, da je pogovorni sistem

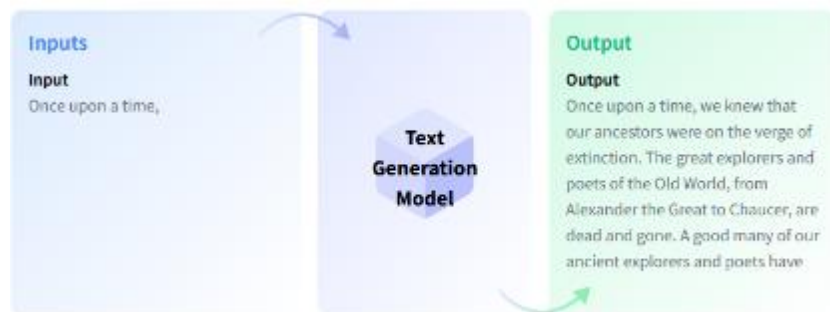


VS.

Pogovorni sistem v resnici



Veliki jezikovni modeli



Klasična uporaba generativnega modela



Pogovorni sistem

- Pogovorni sistemi so popularna **aplikacija** velikih jezikovnih modelov
 - **Ne pa tudi edina!**
- Obstaja več tipov velikih jezikovnih modelov
 - **BERT** – klasifikacija besedil, zaznavanje sovražnega govora, analiza sentimenta
 - **GPT** – generiranje besedil, strojno prevajanje, pogovorni sistemi
 - **T5** – funkcionalnosti modelov BERT in GPT hkrati
 - Zgoraj omenjeni temeljijo na arhitekturi nevronske mreže **Transformer**
 - Pojavljajo se tudi novi modeli, ki temeljijo na drugih arhitekturah

Večmodalnost in sklepanje

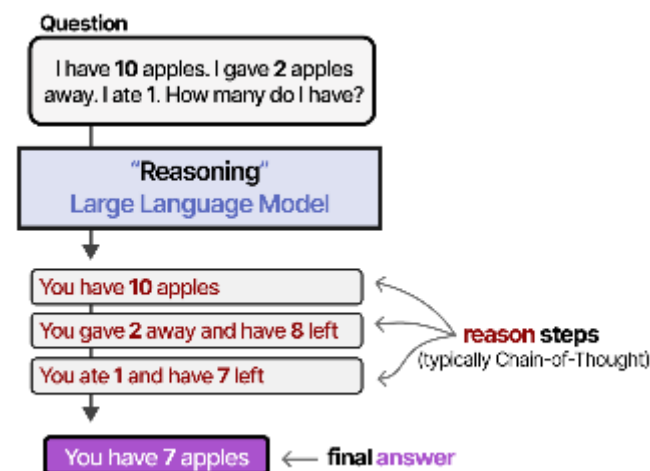
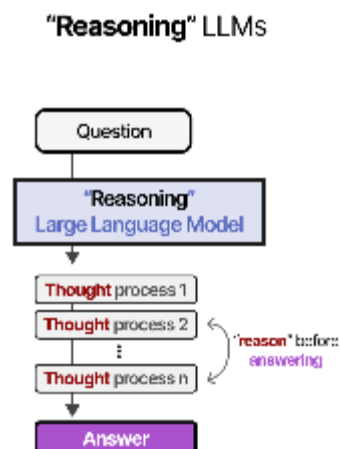
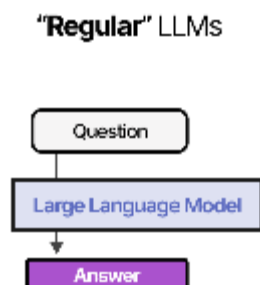
■ Veliki večmodalni modeli (ang. large multimodal models – LMM)

- Obdelava in generiranje tudi drugih modalnosti (slike, video, zvok, točke v 3D prostoru, ...)
- GPT-4o (ChatGPT), Gemini 2.5 (Gemini), Claude 3.5 (Claude)



■ Modeli s sklepanjem (ang. reasoning models)

- Zmožnost “razmišljanja” z namenom izboljšanja odgovorov
- o1, o3 in o4 (ChatGPT), Gemini 2.5 (Gemini), Claude 3.7 (Claude), DeepSeek-R1 (DeepSeek)



Umetna inteligenca in digitalni arhivi

- Digitalne knjižnice in repozitoriji
 - **Klasifikacija** in **označevanje** dokumentov ter gradiv
 - Priporočilni sistemi (funkcionalnost “preberi tudi”)
 - **Povzemanje** dokumentov
 - **Pogovorni sistemi** (“pogovor z dokumentom”)
- Semantično **iskanje**
 - Dokumenti, slike, druga gradiva
- Optična prepoznavna znakov (ang. optical character recognition – OCR)
 - Skeniranje gradiv in **digitalizacija**
 - Trajno shranjevanje kulturne dediščine
- [Zhang et. al, 2023](#), ArcGPT: A Large Language Model Tailored for Real-world Archival Applications

Aplikacije umetne inteligence v raziskavah

- Branje zoglenelih zvitkov z območja Herkulaneja med izbruhom Vezuva



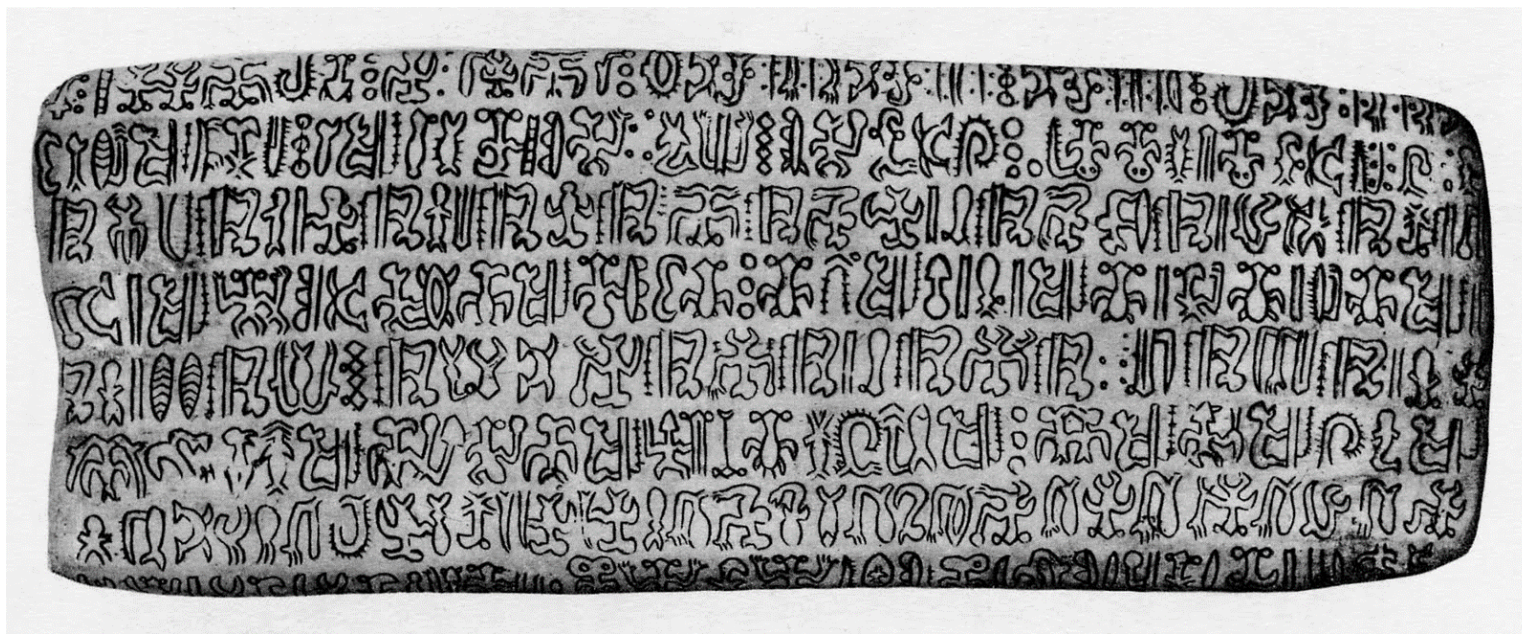
- Obetaven pristop za zaznavanje črnih na 3D rentgenskih slikah zvitkov
 - Ločevanje zoglonelega papirusa od črnih z uporabo [nevronske mreže](#)

Aplikacije umetne inteligence v raziskavah

■ “Dešifriranje” pisave Rongorongo (Velikonočni otok – Rapa Nui)

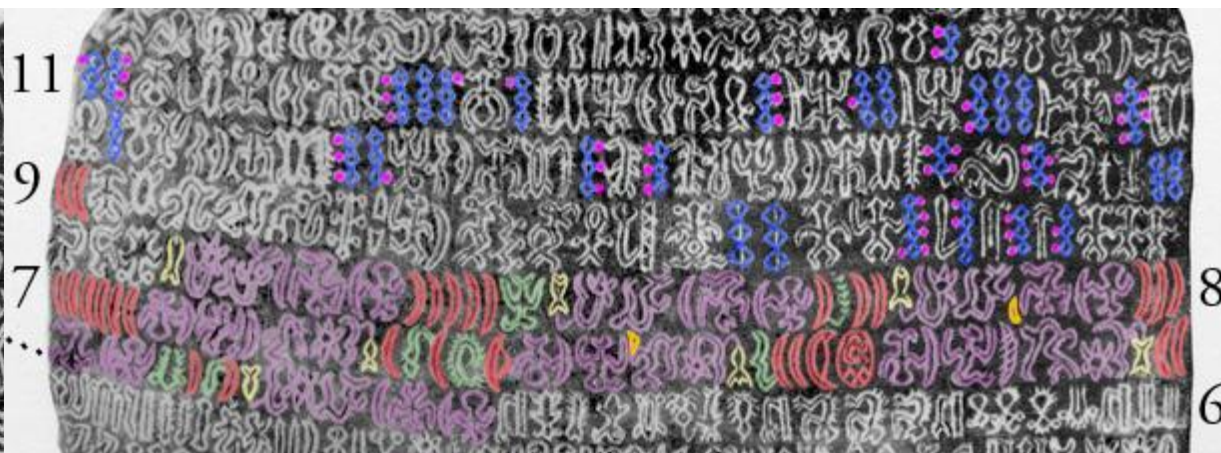
- Predvsem tablica Échancrée, ki je najbolj ohranjena
- **Obratni bustrofedon** – način pisanja, pri katerem se smer pisanja v vsaki naslednji vrstici obrne in rotira za 180 stopinj

WRITING TABLETS WITH RONGORONGO GLYPHS. ←
 ARTICLE ON THE OX TURNING METHOD OF INSC ←
 WRITTEN SPECIFICALLY FOR THE WIKIPEDIA A ←
 Začetek → THIS EXAMPLE OF BUSTROPHEDON TEXT WAS



Aplikacije umetne inteligence v raziskavah

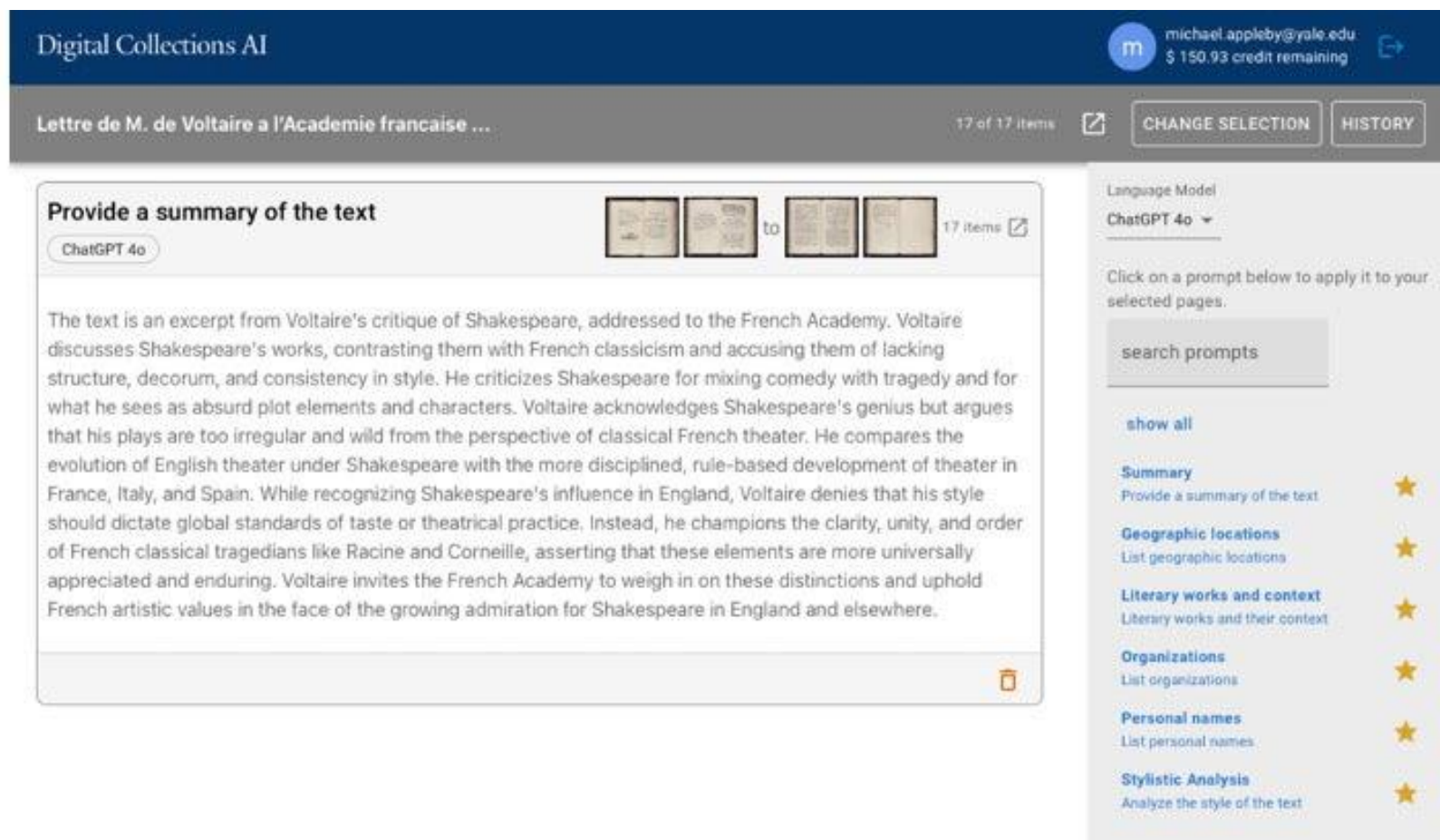
- “Dešifriranje” pisave Rongorongo (Velikonočni otok – Rapa Nui)



Aplikacije umetne inteligence v raziskavah

■ Orodje Yale Digital Collections AI (Yale Library)

- Uporaba umetne inteligence nad digitalnimi gradivi v knjižnici



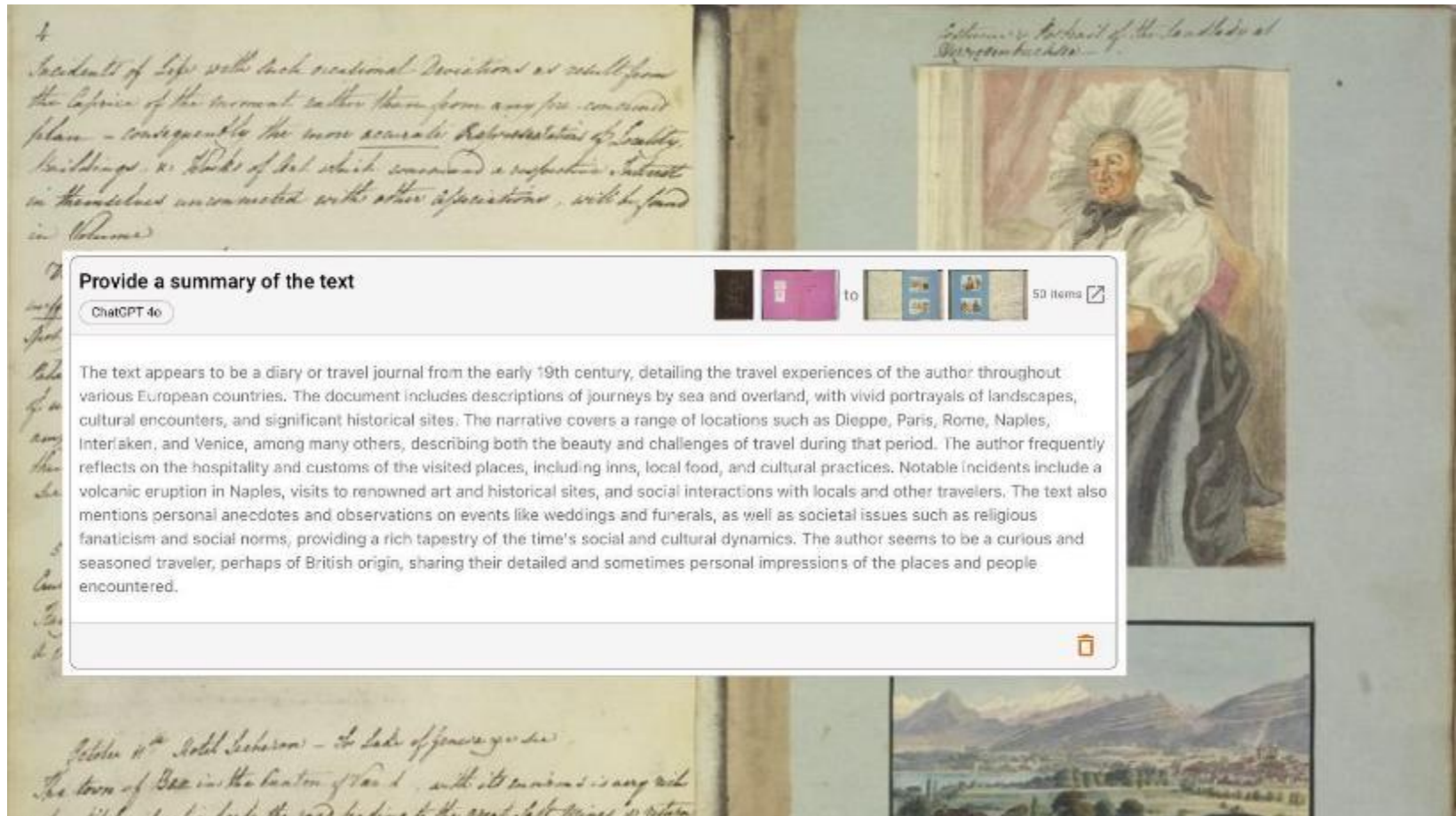
The screenshot displays the 'Digital Collections AI' interface. At the top, a user profile for 'michael.appleby@yale.edu' shows '\$ 150.93 credit remaining'. The main header indicates the selected text is 'Lettre de M. de Voltaire a l'Academie francaise ...' with '17 of 17 items' available. Below this, a section titled 'Provide a summary of the text' features a 'ChatGPT 4o' button and a visual representation of the text as a series of book pages. The generated summary states: 'The text is an excerpt from Voltaire's critique of Shakespeare, addressed to the French Academy. Voltaire discusses Shakespeare's works, contrasting them with French classicism and accusing them of lacking structure, decorum, and consistency in style. He criticizes Shakespeare for mixing comedy with tragedy and for what he sees as absurd plot elements and characters. Voltaire acknowledges Shakespeare's genius but argues that his plays are too irregular and wild from the perspective of classical French theater. He compares the evolution of English theater under Shakespeare with the more disciplined, rule-based development of theater in France, Italy, and Spain. While recognizing Shakespeare's influence in England, Voltaire denies that his style should dictate global standards of taste or theatrical practice. Instead, he champions the clarity, unity, and order of French classical tragedians like Racine and Corneille, asserting that these elements are more universally appreciated and enduring. Voltaire invites the French Academy to weigh in on these distinctions and uphold French artistic values in the face of the growing admiration for Shakespeare in England and elsewhere.'

On the right side, a 'Language Model' dropdown is set to 'ChatGPT 4o'. Below it, a 'search prompts' box is present. A list of 'show all' categories is displayed, each with a star icon: 'Summary' (Provide a summary of the text), 'Geographic locations' (List geographic locations), 'Literary works and context' (Literary works and their context), 'Organizations' (List organizations), 'Personal names' (List personal names), and 'Stylistic Analysis' (Analyze the style of the text).

Aplikacije umetne inteligence v raziskavah

■ Orodje Yale Digital Collections AI (Yale Library)

- Uporaba umetne inteligence nad digitalnimi gradivi v knjižnici



The screenshot displays the Yale Digital Collections AI interface. On the left, a handwritten text document is visible, with a section titled "Incidents of Life with such occasional Deviations as result from the Caprice of the moment, rather than from any pre-conceived plan - consequently the more accurate Reproductions of Reality, Buildings, & Works of Art which command a respectful interest in themselves unconnected with other speculations, will be found in Volume 4." On the right, a portrait painting of a man in a white wig and blue coat is shown. The interface includes a search bar with the text "Provide a summary of the text" and a button labeled "ChatGPT 4o". Below the search bar, a summary of the text is provided:

The text appears to be a diary or travel journal from the early 19th century, detailing the travel experiences of the author throughout various European countries. The document includes descriptions of journeys by sea and overland, with vivid portrayals of landscapes, cultural encounters, and significant historical sites. The narrative covers a range of locations such as Dieppe, Paris, Rome, Naples, Interlaken, and Venice, among many others, describing both the beauty and challenges of travel during that period. The author frequently reflects on the hospitality and customs of the visited places, including inns, local food, and cultural practices. Notable incidents include a volcanic eruption in Naples, visits to renowned art and historical sites, and social interactions with locals and other travelers. The text also mentions personal anecdotes and observations on events like weddings and funerals, as well as societal issues such as religious fanaticism and social norms, providing a rich tapestry of the time's social and cultural dynamics. The author seems to be a curious and seasoned traveler, perhaps of British origin, sharing their detailed and sometimes personal impressions of the places and people encountered.

Regulacija umetne inteligence

- Svet zaenkrat **ni enoten** glede pristopov k regulaciji umetne inteligence
- Evropska Unija – **EU AI Act**
 - AI Liability Directive (predlog)
- ZDA – smernice na nivoju zveznih držav
 - SB 1047 “California AI bill”
 - Algorithmic Accountability Act (predlog)
- Kanada – AI and Data Act (predlog)
- Kitajska – več obstoječih smernic za razvoj in uporabo umetne inteligence
- [Global AI regulations tracker](#) – pregled po državah
- Veliko se govori o regulaciji **generativne** umetne inteligence
 - **Drugi tipi umetne inteligence (npr. priporočilni sistemi) niso omenjeni nikjer!**

Orodje ali orožje?

- AIDEA podkast #90 – november 2022
 - [Umetna inteligenca, superinteligenca in prihodnost interneta](#)



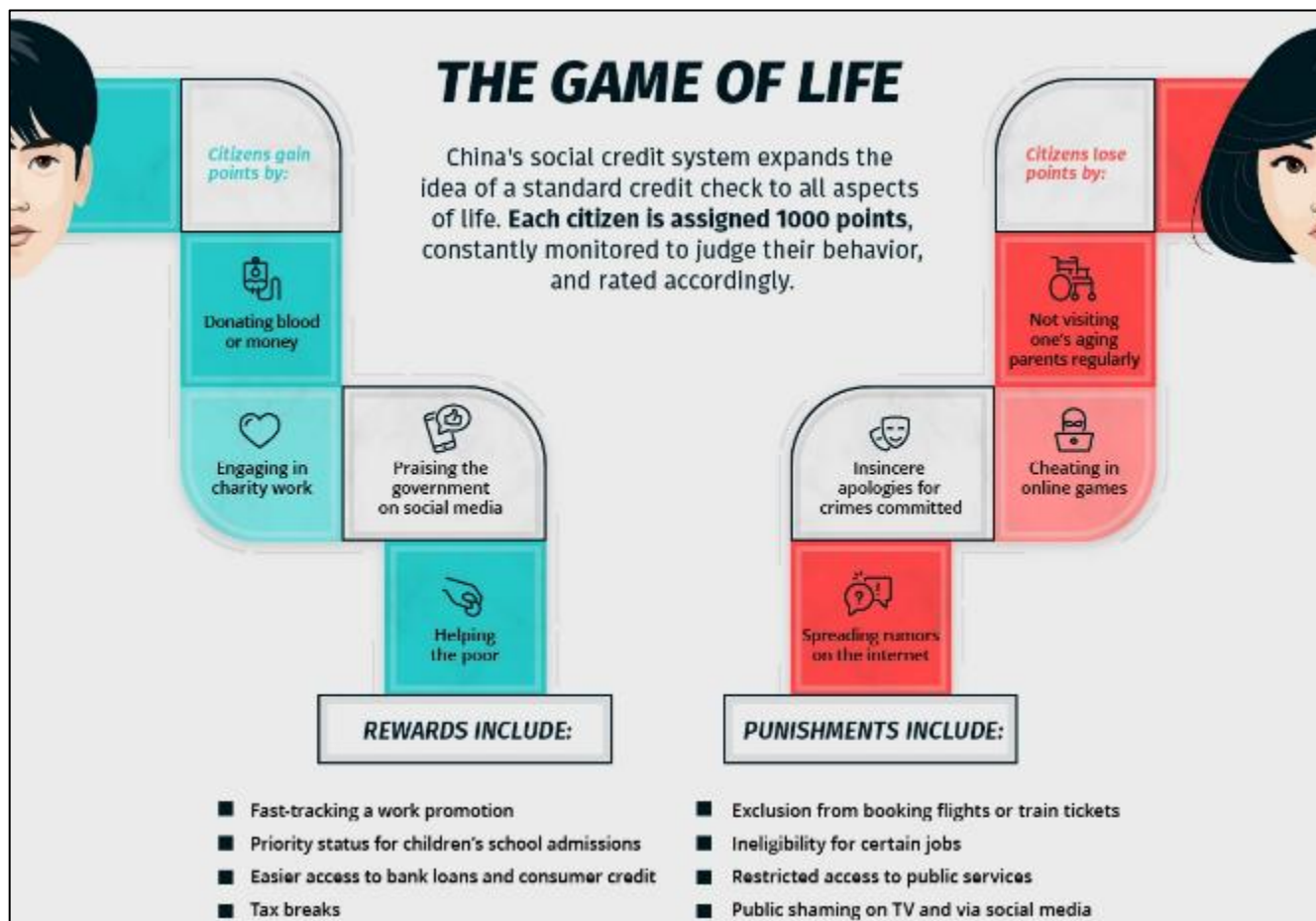
Orodje ali orožje?

- Sistemi umetne inteligence v avtonomnih vozilih so v **pomoč** voznikom
- Pomoč pri manevriranju (ohranjanje vozila v voznem pasu)
- Nadziranje mrtvega kota pri menjavi voznega pasu
- Avtomatski klic SOS s posredovanjem lokacije v primeru nesreče
- Navigacijski sistemi
- Pametni asistenti
- Varnostna razdalja
- Adaptivni tempomat
- Parkirni asistenti



Orodje ali orožje?

- Kitajska (2011+) – državni kreditni sistem, ki spremlja obnašanje državljanov

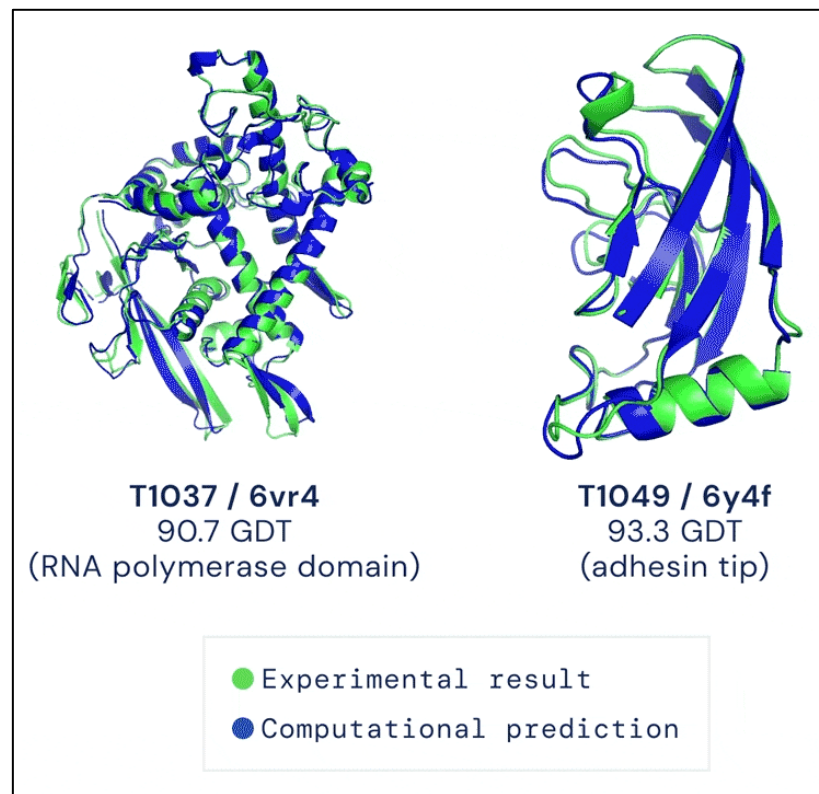


Orodje ali orožje?

■ DeepMind AlphaFold (2020) – zvijanje proteinov je **praktično rešen problem**

■ Razumevanje bolezni in virusov

- Alzheimerjeva bolezen
- SARS-Cov-2 (COVID-19)
- Malaria
- Rotavirus
- Parkinsonova bolezen



Orodje ali orožje?

- ChatGPT se uporablja kot pripomoček pri generiranju skript in elektronskih sporočil za **spletne prevare**



Hello, this is Microsoft Technical Support. We have detected some suspicious activity on your computer and it appears that your device has been infected with a virus. Our records indicate that your license key has expired and your system is no longer protected. Don't worry though, we can help you fix this problem right away.  

All you need to do is provide us with remote access to your computer and we'll take care of everything. We can help you renew your license and install our latest security software. Please follow our instructions carefully to ensure that we can assist you as quickly as possible.

We take your privacy and security very seriously, so please don't hesitate to contact us if you have any concerns. Thank you for choosing Microsoft Technical Support.

Orodje ali orožje?

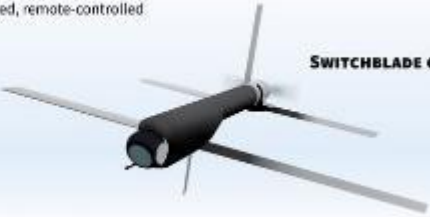
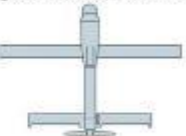
- Ruanda (2023) – avtonomni letalniki (podjetje Zipline) za **dostavo krvi po vsej državi**



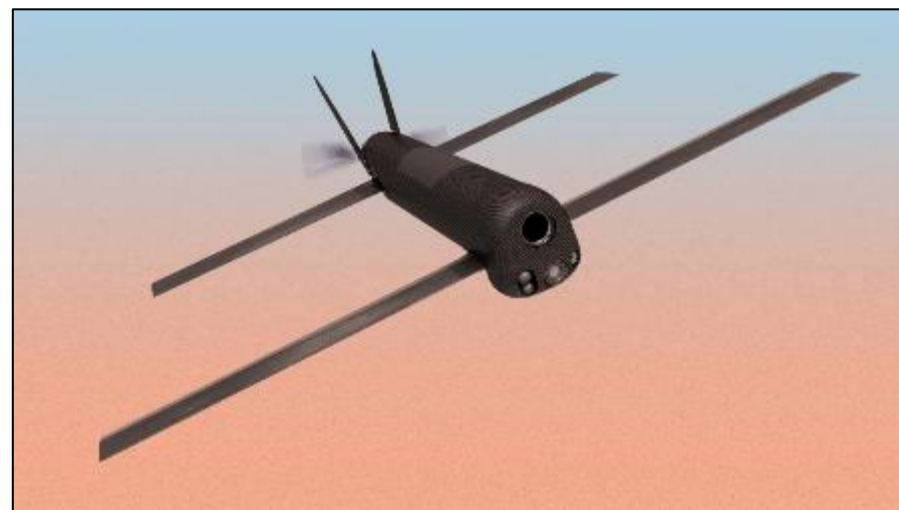
Orodje ali orožje?

- Ukrajina (2023+) – avtonomni vojaški letalniki Switchblade kot **vodene bombe**

'Kamikaze drones'
US-manufactured, man-portable, camera-equipped, remote-controlled flying bombs that explode on contact

SWITCHBLADE 300		SWITCHBLADE 600
		
49.5 cm	Length	1.3 m
Self-contained ground launch and multipack (optional: air or ground vehicle, water craft, etc)	Launcher	Self-contained launcher for ground, air, and maritime
		
2.5 kg (payload, launcher and transport bag, fits inside backpack)	Weight	54.4 kg (including fire control system/munition)
- 2 minutes	System setup time/launch	- 10 minutes
Precision strike with advanced munition	Lethality	Precision strike with anti-armor warhead
10 km/15 mins	Range/endurance	40 km/40 mins
101 kph/161 kph	Speed (cruise/dash)	113 kph/185 kph
Below 500 ft*, (ceiling >15,000 ft**)	Operating altitude	Below 650 ft*, (ceiling >15,000 ft**)

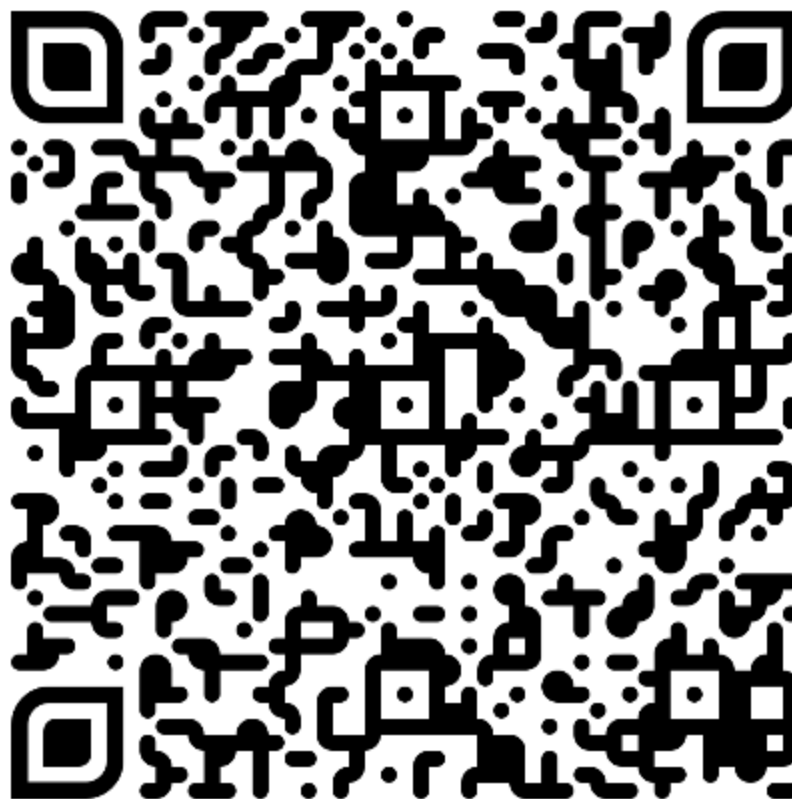
Source: AeroVironment *above ground level **mean sea level AFP



Pogled v prihodnost

- **Izboljšave** umetne inteligence in **stremenje k superinteligenci**
 - Večmodalnost, sklepanje, novi pristopi k učenju inteligentnih sistemov
 - Visokozmogljivo računalništvo (HPC), kvantno (super)računalništvo
- **Avtonomno delovanje** inteligentnih agentov in asistentov
 - Intelligentni agenti bodo delovali kot ekipe
- Spremembe v **vsakodnevnem življenju** zaradi vpliva umetne inteligence
 - Avtonomna vozila, družbena omrežja, umetna inteligenca v izobraževanju
- **Regulacija** umetne inteligence, novi zakoni, priporočila in politike
 - Sodelovanje strokovnjakov v sklopu **multidisciplinarnih skupin**
 - Naravoslovci + družboslovci + tehniki => **Umetna inteligenca je za vse, ne le za izbrane!**

Hvala za pozornost
Vprašanja?



Skenirajte za prosojnice 🖐️